REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 5-14, 17-22, 24-28, 30-70, 73-74 and 76-82 are pending, with Claims 5, 11, 17, 24, 30, 36, 73, 74, 76, 77, and 78 amended, Claims 1, 2, 3, 4, 15, 16, 23, 29, 71, 72, and 75 canceled, and Claims 79-82 added by the present amendment.

In the Official Action, Claims 1, 36 and 71 were rejected under 35 U.S.C. § 102(e) as being anticipated by Islam (U.S. Patent No. 6,052,393); and Claims 2-35, 37-70 and 72-78 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Islam.

Claims 5, 11, 17, 24, 30, 73, 74, 76, 77, and 78 are amended into independent form, including the base claim and all intervening claims. Claims 5, 11, 17, 24, 30, 73, 74, 76, 77, and 78 are further amended to more clearly describe and distinctly claim Applicants' invention. New Claims 79-82 are directed to alternative features disclosed in Applicants' specification. Support for Applicants' new and amended claims is found in the originally filed specification. No new matter is added.

Briefly recapitulating, amended Claim 5 is directed to an optical signal amplifier including: at least one source of pumping light, the source being configured to produce pumping light having a predominant polarization state; and at least one depolarizer having a birefringent optical component having a principal axis oriented at about 45 degrees with respect to the predominant polarization state and coupled to receive the pumping light as an input and having as an output a pumping beam. A Raman gain medium within the optical signal amplifier is configured to receive the pumping beam and optical signals as inputs and to transfer energy from the pumping beam to the optical signals via stimulated Raman scattering, the Raman gain medium is a single mode fiber that is backward pumped, and the

depolarizer is configured to provide an output pumping beam that has a degree of polarization in an inclusive range of greater than 1% through 15%.

Claims 11, 17, 24, 30, 73, 74, 76, 77, and 78 are directed to alternative embodiments, each reciting different ranges and/or Raman gain medium features and/or other features from Applicants' originally filed specification.

Islam describes new developments in Sagnac Raman amplifiers and cascade lasers to improve their performance. The Raman amplifier bandwidth is broadened by using a broadband pump or by combining a cladding-pumped fiber laser with the Sagnac Raman cavity. The broader bandwidth is also obtained by eliminating the need for polarization controllers in the Sagnac cavity by using an all polarization maintaining configuration, or at least using loop mirrors that maintain polarization. The polarization maintaining cavities have the added benefit of being environmentally stable and appropriate for turn-key operation. The noise arising from sources such as double Rayleigh scattering is reduced by using the Sagnac cavity in combination with a polarization diversity pumping scheme, where the pump is split along two axes of the fiber. This also leads to gain for the signal that is independent of the signal polarization. Finally, a two-wavelength amplifier for 1310 nm and 1550 nm can be implemented by using a parallel combination of Raman amplifiers with shared pump lasers or by combining Raman amplifiers with erbium-doped fiber amplifiers. Combinations of the above improvements can be used advantageously to meet specifications for broad bandwidth, polarization independence, noise performance and multi-wavelength operation.[1]

The amplifier disclosed in Islam is composed of a polarization maintaining type fiber including the Raman gain medium. Within the polarization maintaining type fiber, an optical signal and a pumping beam are both separated into two intersecting polarized beams, and the signal light having the same polaratization components is amplified by the pumping beam. In

[1] Islam, abstract.

other words, in the Islam apparatus, the linearly polarized pumping light is equally separated into two polaratization components by being led in a 45-degree inclined state with respect to the main axis of the polarization maintaining fiber, so that the same amplified gain is given to each of the polaratization components. Due to this, the signal light is amplified in such a manner that each of the separated polaratization components is equally amplified regardless of the polaratization state of the signal light, and thus the polarization dependence of gain (PDG) is minimized.

On the other hand, in the Raman amplifier recited in Applicants' independent claims and using a depolarized pumping light source, the linearly polarized pumping light is led in a 45-degree inclined state with respect to the main axis of the polarization maintaining fiber, and after giving a recited phase-delay to the separated two polaratization components, it is led to the Raman amplifier as defined in each of the present claims. Since neither a signal light nor a pumping light is maintained in a polaratization state in the Raman gain medium of the present invention, the pumping light is depolarized by the recited phase-delay thus given in the polarization maintaining fiber, so that its polaratization state is varied at high speed in terms of time and space. By this operation above, a constant gain can be obtained regardless of the instable polaratization state of the light signal.

However, Islam does not disclose or suggest the depolarized pumping light source of the present invention, and there is no disclosure of obtaining a sufficiently small PDG by selecting a depolarized pumping light source having a predetermined DOP, which is inherently determined in accordance with the class of a fiber Raman gain medium either. For example, Islam does not disclose or suggest said depolarizer is configured to provide an output pumping beam that has a degree of polarization in an inclusive range of greater than 1% through 15% as recited in amended independent Claim 5. Similarly, Islam does not

disclose or suggest the corresponding features of amended independent Claims 11, 17, 24, 30, 73, 74, 76, 77, and 78.

MPEP § 2131 notes that "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). See also MPEP § 2131.02. "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). Because Islam does not disclose or suggest all the features recited in Applicants' independent claims, Islam does not anticipate the invention recited in Applicants' independent claims, and all claims depending therefrom.

Applicants traverse the outstanding rejections under 35 U.S.C. § 103(a). First, MPEP §706.02(j) notes that to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Also, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on Applicants' disclosure. *In re Vaeck,* 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir.1991). Without addressing the first two prongs of the test of obviousness, Applicants submit that the Official Action does not present a *prima facie* case of obviousness because Islam fails to disclose all the features of Applicants' claimed invention.

Furthermore, by way of background, the inventor of the present invention has discovered the fact that PDG of a Raman amplifier is determined in accordance with DOP of

a pumping light source, and also the relation between the DOP and the PDG is prominently varied depending on the class of a fiber and the direction of pumping. The inventor has also discovered the fact that the DOP of each of the manufactured pumping light sources is quite different among them, and when an arbitrarily selected pumping light source is paired with a freely selected Raman amplifier, there are many cases observed in which the PDG of the amplifier is not within a predetermined scope thereof.

The inventor has documented this technical feature in the specification to clarify that the pumping light source used in the present invention is the one that has DOP which is most suitable to the class of a fiber used and the direction of pumping. Since by this fact a Raman amplifier having PDG within a predetermined scope can be stably obtained regardless of the class of a fiber, the above-mentioned problem can be solved, and the yield of a light source device for good Raman gain and a Raman amplifier can be greatly improved. Simultaneously, since a conventional pumping light source out of specification range (due to its too large DOP) may also be used, the present invention allows for the yield of the pumping light source to also be improved.

In contrast, in Islam, there is no disclosure whatsoever of performing Raman amplification by the Raman gain fiber by use of a depolarized pumping light source. There is also no disclosure of the use of a pumping light source having DOP which is most suitable to the class of fiber and the direction of pumping. Also, in Islam, there is no disclosure of relation between DOP and PDG. Thus, Islam does not contemplate the problem of discrepancy in DOP quality of the manufactured pumping light sources. Islam also does not contemplate the problem caused in a case in which when an arbitrarily selected pumping light source is paired with a freely selected Raman amplifier.

In short, in the present invention the pumping light source is depolarized, which is different from Islam reference, there is no need to make a fiber such as a Raman

amplification fiber (Raman gain medium), through which signals are transferred, a polarization maintaining type, and thus, the configuration of the Raman amplifier is made simple as a whole, and even a conventional fiber can be used as a Raman amplification fiber After all, in Islam reference, there is neither such construction as of the present invention, nor even a suggestion for constructing that way.

Thus, for the reasons stated above, Applicants submit there is no teaching, suggestion, or motivation, either explicitly or implicitly, in Islam to modify the teachings of Islam to arrive at Applicants' inventions recited in Applicants' claims. Thus, Applicants submit it is only through an impermissible hindsight reconstruction of Applicants' invention that the rejection of any of Applicants' claims under 35 U.S.C. § 103(a) can be understood.[2]

Accordingly, in view of the present amendment and in light of the previous discussion, Applicants respectfully submit that the present application is in condition for allowance and respectfully request an early and favorable action to that effect.

Respectfully submitted,

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[2] MPEP § 2143.01 "Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge of one of ordinary skill in the art."